REPORT OF CASES OF TRAUMATIC INJURY TO SPINAL CORD.

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THE following cases, one of which is reported in conjunction with Dr. J. W. Wright, have a direct bearing upon the subject of traumatic injuries of the spinal cord and their relief by surgical operations.

The first I case saw through the courtesy of Dr. S. D. Powell. The patient was a man, thirty-four years old, who, two weeks previous to the time I first saw him, had been knocked down and injured in the back by a heavy weight of merchandise which fell over upon him. Examination showed that there was a well marked protrusion at the junction of the dorsal and lumbar vertebræ. There was paralysis of the sphincter of the bladder and anus, but no other muscular paralysis. The knee-jerk was present in both legs, but was very sluggish. The gait was slightly ataxic, and slight swaying was observed when he attempted to stand with his feet together and his eyes closed.

All forms of sensibility were nearly normal in the feet, legs and thighs. He was not always accurate in locating a touch on the buttocks and thighs, and the muscular sense below the knees was slightly diminished. There was an area of absolute loss for all forms of sensibility, circular in extent, with the anus as a centre, and a diameter of about three inches.

I advised an immediate operation, which Dr. Powell performed. He found a fracture of the eleventh dorsal vertebra. A piece of the bone, with serated edges, was pressing against the posterior columns of the cord. This was, of course, removed. With the relief of the pressure on the cord the symptoms gradually subsided, until at the expiration of two months he seemed to be perfectly well. The remarkable feature of this case is the exceedingly limited area of complete anæsthesia. In a number of similar cases collected and reported by Starr, there was not one in which the area of anæsthesia was so circumscribed.

The second case I saw at the request of Dr. Phelps.

The patient was injured on September 1, 1890. The manner of his injury has already been described by Dr. Phelps. Following the injury he was immediately paralyzed in both legs. The paralysis was absolute for nine months. At the expiration of that time motion began to return in the right thigh. There was also, at first, complete loss of all kind of sensation from the level of the pubes downwards, including the penis and scrotum. A distended bladder caused pain, but the urine could not be voluntarily evacuated. It had to be drawn for five months. Then paralysis of the sphincter developed and he was unable to hold the urine. This continued for six or seven months. After that he again became continent.

For the first three months he could not voluntarily evacuate the bowels, then for three months he could not retain the contents of the rectum. After that he regained power over the sphincter. Three days after the accident a bed sore formed on the sacrum. It was still present when I first saw him. When I examined him I found he was unable to stand. He was able to flex the right knee only with great effort. The left limb was almost completely paralyzed. On great effort slight contractions could be observed in the left quadriceps, but not of sufficient power to stir the limb. Below the knees both legs were paralyzed. The gastrocnemii were contracted, giving rise to double talipes equinus.

The plantar reflexes on both sides were lost, both knee-jerks were absent, cremaster reflex was present on the right side, but lost on the left side; both abdominal reflexes were present.

On the front of the body sensibility of all kinds was lost in the right leg from the knee downwards: in the left leg from a level of the pubes downwards. All sensibility was also lost in the glans penis, the scrotum and perineum. Touch, pain and temperature were plainly perceptible on the penis, from the glans to the pubes. Sensation was normal from the pubes upwards. On the back of the body, from a point on a level with the twelfth dorsal vertebra, the area of the loss of all kinds of sensibility extended downwards and outwards. In the right leg the outward limiting line of the anæsthesia did not extend quite to the median line until the knee was reached. Here it swept around the leg and joined the upper line of anæsthesia on the front of the limb. On the left side the anæsthetic area involved all of the back of the thigh and more than half of the gluteal region.

Above the twelfth dorsal vertebra and on each side of the anæsthetic area, there was for a limited space slight hyperæsthesia. On the accompanying chart the area of anæsthesia is indicated by lines; the hyperæsthesia by dots.

As one cremasteric reflex was present and one was absent, and as both abdominal reflexes were perfect, there was no hesitation in locating the injury to the spinal cord at the level of the twelfth dorsal vertebra.

The operation proved the correctness of the diagnosis. The twelfth vertebra was found to have been fractured and the cord was greatly compassed. A certain amount of improvement was observed the day after the operation. Tactile sense was restored on the front of the thighs. He could feel and locate a touch accurately, but all other forms of sensibility were still absent. Gradually slight motion returned in the left thigh, and the right thigh became stronger than it had been. Finally, after two months, he was able to walk around with the aid of crutches.

The clinical history of the third case you have already heard from Dr. Wright. The pathological history is as follows:

The specimen of the cord which I received from Dr. Wright, consisted of a piece three and a quarter inches long, beginning at the level of the second cervical nerves and ending at about the level of the second dorsal nerves. At the point of the injury the cord was greatly compressed, and measured only one-eighth of an inch in thickness. Both above and below this point the cord gradually increased in size until about half an inch either way the full size of the cord was reached. The specimen had been hardened in alcohol. I removed it to Müller's fluid, where it was kept for three months. Sections were stained in Weigert's hæmatoxylon, in soda-carmine and in a double stain of both of these agents.

The meninges were thickened and adherent to each other, and the pia was firmly attached to the cord. At the point of greatest injury the cord measured one-eighth of an inch antero-posteriorly and three-eighths of an inch transversely. The central canal is obliterated, but a cavity, which is evidently the result of traumatism, extends transversely across the cord. There is no evidence of epithelial lining anywhere on the periphery of the cavity. It extends nearly the entire transverse distance of the cord where the compression was greatest, and gradually diminishes both upwards and downwards from this point for about three-eighths of an inch, when it becomes imperceptible.

In the substance of the cord no gray matter can be recognized. Dense connective tissue seems to have taken the place of nearly all the normal elements of the cord. Where the anterior horns ought to be a few motor cells can be seen, without processes and in advanced stages of pigmentary and granular degeneration. In two or three places the remains of fibre tracts may be observed, but the few fibres which remain are surrounded by dense connective tissue and are mainly degenerated.

At a higher level, where the different tracts can be discerned, Burdach's columns are degenerated, while Goll's columns are but slightly affected. The crossed and direct pyramidal tracts, Gower's tracts and the direct cerebellar tracts are all degenerated. The motor cells are numerous and well preserved, but the motor roots are greatly degenerated, probably in consequence of pressure from the sclerosed tissue through which they pass. The posterior horns and posterior nerve roots are pushed laterad and are degenerated. At a still higher level, beyond the point where the degenerated posterior roots have merged into Goll's columns, the latter are in a high state of degeneration, while Burdach's columns, with the exception of the periphery, are apparently normal. The pyramidal tracts are but slightly affected. The anterior and posterior horns are normal, and the motor cells are numerous and perfect in every particular. The motor roots and Gowers' columns and the direct cerebular tracts are still degenerated.

Below the lesion the posterior columns are nearly normal. The pyramidal tracts are completely degenerated. The motor cells seem to be nearly as numerous as they should be and in an excellent state of preservation. The motor roots are slightly degenerated near the periphery of the cord.

This case is of particular interest as it corresponds, from a clinical aspect, very closely with the fifth case, described by Dr. Phelps.

In both cases there was a similar accident. Both individuals fell from a height and struck directly upon the vertex of the skull; both were immediately paralyzed from the neck downwards for both motion and sensation, and both partially recovered. In Dr. Wright's case the fifth and sixth vertebral were telescoped, the resulting deformity causing severe compression of the cord. In Dr. Phelps' case bony compression of the cord was not in evidence, but there was a fibrinous deposit which surrounded the cord and which Dr. Phelps removed. This was probably the remains of an old hæmorrhage.

These three cases, and those reported by Dr. Phelps, show that operative surgery, to be efficacious, must be resorted to soon after the injury has been received. Pressure prolonged for any length of time invariably causes degeneration, both ascending and descending, of the different tracts in the cord. Relief of the pressure is not followed by any diminution of the degeneration. But relief of the pressure prevents the process of degeneration from beginning. Hence, the surgeon should operate as soon as possible after injury to the cord has been received, and by removing the pressure, whether it be from displaced bone, a hæmorrhage, or a foreign body, prevent the degeneration of the cord, which he will be powerless to alleviate if he waits until it becomes well established. The case reported by Dr. Wright, and the fifth case reported by Dr. Phelps, could, in my opinion, both have been benefitted, and perhaps entirely cured, by an immediate operation.

A Case of Paralysis, due to Acute Inflammation of the Medulla (*Vandervelde, Jovrnal de Med. de Bruxelles, April 2, 1892*).

The patient, 24 years old, no particular preceding family or personal history, had been suffering for twenty-one days when brought to the hospital. He had at first a sore throat, then twelve days afterward began to have fever, at the same time inability to swallow, and later, difficulty in walking. On examination, he was found to have, besides vertigo and headache, inequality of pupils with preservation of light reflex, convergent strabismus, trouble in deglutition, hemiparesis of the entire right side, ulteriorly, convulsive crises. Cheyne-Stokes respiration, coma at death. At the autopsy there was found to be diffuse alteration of the medulla, involving both the gray and white substance. In the cord the lateral columns showed the degenerative lesion. The author thinks that the disease first showed itself in the anterior gray cornua, then in the posterior gray substance. The lesions in the white substance he considers secondary.

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